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These considerations led the Trinity house to the opinion that the Wigham gas system in single form could in a very few cases be employed at its higher powers without risk of perplexing the mariner; that the highest power at which its single burner could be used under every required condition was also obtainable by oil; that its special novelties in distinctiveness, as introduced at Galley Head, would only be available at widely separated stations; and that where space and considerations of expense permitted the use of gas in triform or quadriform, electricity would also be admissible, and, by its suitability for optical treatment, would be better adapted for producing the effects required in coast illumination; and, finally, its own experience with the two gas-lighted towers at Hasborough was not such as to encourage a more extended application.

The Commissioners of northern lighthouses, in answer to the letter of the Board of trade, send a report from Messrs. Thomas Stevenson and J. A. Crichton, which, in the main, agrees with that of the Trinity house.

From the paper read by Sir James Douglass before the British association in Montreal may be gleaned a few facts as to the relative powers of the best lights now in use, which are not mentioned in the correspondence just described. He states that the first electric light used in an English lighthouse in 1858 was of 700-candle power, whereas an intensity of 50,000-candle units is now found to be practically and reliably available for the focus of an optical apparatus; so that, with regard to intensity, this luminary outstrips all competitors. Compact flames are now being produced from oils and coal-gas, having an intensity of 1,500 to 2,000 candles; while, with the 108-jet Wigham burner, an intensity of nearly 3,000 candles has been reached. With regard to economy, mineral oil has the advantage of all its rivals up to the maximum intensity at which an oil light is practicable, and has the further advantage over electricity or gas in its ready application at any station, however isolated, and in many cases where the use of the other illuminants would be impracticable. He proceeds to show that fixed lights are no longer to be considered trustworthy coast-signals, owing to their liability to confusion with other lights, and that the period of a light should not exceed half a minute; further, that time should not form an element in the determination of the distinctive character of a light. On the coast of England the Trinity house is converting all fixed lights to occulting, where local dangers are required to be covered with red sectors, or sectors of danger-light. For this the electric light is eminently adapted. In cases where this local mapping-out of dangers is not required, flashing lights, in consequence of their higher intensity, are being adopted.

Referring to the optical apparatus of the new Eddystone lighthouse, he describes it as consisting of two superposed tiers of lenses with a six-wick Douglass oil-burner in the focus of each. In this respect a part of Mr. Wigham's system has assuredly been copied. With a clear atmosphere, the lower

burner only is worked at its minimum intensity of about 400-candle units, giving an intensity of the flashes of the optical apparatus of about 37,000 candles; but in thick weather the full power of the two burners is put in action, with an aggregate intensity in the flashes of the optical apparatus of about 159,000-candle units. This intensity is about 23 times greater than that of the fixed light latterly exhibited from the old tower, and about 2,380 times the intensity of the light originally exhibited in the same tower, at about the same cost, from tallow candles.

THE ESSEX DENEHOLES.

THE word 'denehole' means 'denhole,' and is pronounced 'danehole.' Those of Kent and South Essex may be described as consisting of narrow vertical shafts leading to artificial chambers excavated in the chalk, their depth varying with the distance of the chalk beneath the surface. They are found singly, in groups of twos and threes, or in larger collections of perhaps fifty or sixty pits.

Our illustrations show two types of the varieties of form exhibited by deneholes. The beehive shape is especially common in the shallower pits, which are wholly, or almost wholly, in chalk. A drawing of a pair of such pits discovered in a chalk cliff at Crayford brickfields is given (fig. 1). Their depth was

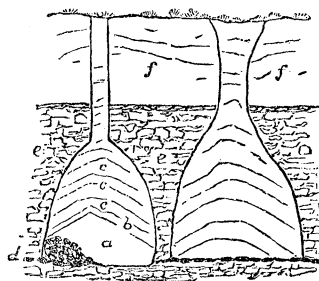


FIG. 1.

thirty-seven feet, and the greatest width eighteen feet. The walls showed no signs of metal picks, and the chalk blocks must have been prized out, but they were well and symmetrically worked. In one was a layer of very hard clay, washed into a cone at the bottom, and containing flint flakes, scrapers, and a 'core:' above that a layer of Roman pots and pans (a Samian dish, etc.) rested, followed by some very fragmentary and coarse potsherds and confused rubbish, apparently intended to fill the hole up to the surface of the ground. The sister-cave did not show an equal stratification of debris, and appeared to have fallen in at an early period.

Of the deeper deneholes existing in Hangman's Wood, one (fig. 2) is eighty feet deep. In three examples at Hangman's Wood (not figured) there were six chambers, while in two at Bexley only three chambers radiated from the shaft. A final stage in denehole evolution seems to have been the removal

of the greater portion of the partitions separating the chambers, pillars of chalk only being left to support the roof. The usual height of denehole chambers may be said to be from ten to twenty feet. A leading characteristic of deneholes is the separation of each pit from its neighbor, though they are often so close together that much care must have been exercised to prevent intercommunication. Another is the fact, that, while they are here and there abundant in bare chalk, they are often especially numer-

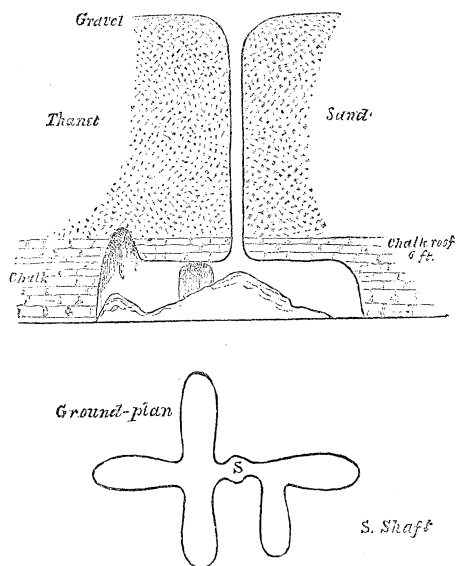


FIG. 2.

ous where the top of the chalk is fifty to sixty feet below. Thus at Hangman's Wood, for example, the top of the chalk is fifty-six or fifty-seven feet below the surface, while there is plenty of bare chalk within a mile.

Though there are more than fifty separate deneholes in Hangman's Wood, each shaft being at an average distance of about twenty-five yards from its nearest neighbor, only five shafts are now open, the rest having fallen in at various times. In most instances, however, there is nothing to suggest that the chambers below have been materially, if at all, injured, the funnel-shaped hollow at the surface being but little greater than those around the mouths of shafts still open. This closing of the great majority of the shafts is not by any means simply disadvantageous to denehole explorers, though it certainly increases the cost of exploration; for it is obvious that closed pits necessarily afford more satisfactory evidence than such as have been visited from time to time, either from curiosity or to recover a lost sheep or hound.

Preliminary examinations of six of the deneholes in Hangman's Wood were made during the summers of 1882 and 1883. A more thorough investigation is now in progress.

RECENT AFRICAN EXPLORATION.

No news has been received at Zanzibar from Giraud since he was deserted by his caravan. A number of the deserters have been arrested and imprisoned under grave charges, but their trial will be deferred until some definite information of the traveller's fate has been received. The French consul asserts, with reason, that an example must be made if it proves that Giraud has been betrayed: otherwise there can be no safety for future explorers.

The distressing news has been received of the total destruction by fire of the fine establishment of the missionaries du Saint-Esprit at Mrogoro. They were left without food or clothing, and the result of their severe labor for two years was destroyed at one blow. The fire would seem to have been accidental; since the natives about them are friendly, and have modified, at the suggestion of the missionaries, many of their savage customs, especially that of human sacrifices, which a year ago were common. Assistance has been sent to the sufferers.

From the Zambezi, news of the death of Commander Foot has been received. It occurred at Blantyre, where he had been appointed English consul. His wife and two children, unable during the prevalent disorders on the upper Zambezi to reach the coast, have taken refuge at the Protestant mission at the junction of the Ruo and Sheri rivers. The deceased was well known in connection with African exploration, and especially with routes of trade and travel in central Africa.

Mr. Hore of the English missionary society has recently started for Ujiji, with his family, a considerable caravan, and two young missionaries, who will assist him in his work.

Some time since, we referred to the operations of Paul Soleillet in the region of Shoa, and his success in establishing friendly relations with King Menelik. The traveller, who left France about three years ago, has now returned to civilization, and, at a recent séance of the Société de géographie, gave interesting details of his journey, and of the character of the region explored by him in the interests of French commerce. The port of Obok, opposite the English military station of Aden, has been occupied by France since 1856, but has only been raised to the rank of a naval coaling-station during the past year.

Behind Obok rises the irregular surface of the Ethiopian highlands, extending westward to the Nile, and southward to the little-known region which encloses the great lakes of equatorial Africa. At different altitudes on its ridges, which rise from five thousand to eleven thousand feet, one finds a succession of all the climates of the torrid and temperate zones. The olive, cypress, indigo, and coffee plants grow wild there; while cotton, sugar-cane, the vine, and cereals are successfully cultivated. In the same regions where the elephant, buffalo, and rhinoceros flourish in a state of nature, one finds innumerable herds of cattle, sheep, and horses. Soleillet succeeded in opening a caravan route to Kaffa by way of Shoa, which is subject to the usual objections of time and